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(54) OPTICAL DISK PROVIDED WITH BAR CODE

OPTISCHE PLATTE MIT STRICHKODE

DISQUE OPTIQUE AVEC CODE BARRES

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(56) References cited:

EP-A- 0 549 488	EP-A- 0 553 545
EP-A- 0 741 382	DE-A- 4 308 680
JP-A- 2 007 243	JP-A- 4 162 224
JP-A- 56 025 242	JP-A- 58 211 343
JP-A- 60 193 143	JP-A- 61 071 487
NL-A- 9 101 358	US-A- 4 677 604

- **PATENT ABSTRACTS OF JAPAN vol. 016, no. 495 (P-1436), 14 October 1992 & JP 04 178967 A (DAINIPPON PRINTING CO LTD), 25 June 1992,**

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Description

[0001] The invention refers to an optical disk as set forth in the preamble of claim 1 and a reproduction apparatus for reproducing such optical disk. An optical disk and reproduction apparatus of this kind are known from EP-A-0 741 382.

[0002] In the manufacturing process of optical disks, it has been commonly practiced to record a serial number, lot number, etc. on each optical disk in the form of a barcode.

[0003] Since such information cannot be written to a pit information area of the optical disk, it has been practiced to write the barcoded information to a non-information area, or unused space on the optical disk.

[0004] When reproducing (playing back) such an optical disk, the pit information is read by an optical pickup; to read the barcoded information such as serial number, etc. recorded in the non-information area, however, a separate reading device has been used, Increasing complexity of the reproduction apparatus.

[0005] However, there are also optical disks available which do not comprise such barcode-like mark. If the reproduction apparatus is designed to utilize a barcode-like mark provided on the disk operation of the reproduction apparatus may cause problems if such mark is missing on the disk, inserted into the reproduction apparatus.

[0006] It is the object of the invention to provide an optical disk of the afore-mentioned kind which facilitates operation of a reproduction apparatus. It is another object of the invention to provide a respective reproduction apparatus.

[0007] These objects are obtained by the features of claims 1 and 3, respectively. Preferred embodiments thereof are subject matter of the dependent claims.

[0008] The present invention provides an optical disk wherein a data area is provided for holding therein an identifier for indicating the presence or absence of a barcode-like mark on the disk so that the operation of the disk player reproducing the disk may be controlled dependent on the presence or absence of the barcode-like mark.

[0009] The invention is now explained with reference to the accompanying drawings.

Figure 1 is a diagram showing a disk manufacturing process and a secondary recording process;
Figure 2(a) is a top plan view of a disk, (b) is an enlarged top plan view of a portion of the disk, (c) is a further enlarged top plan view of a portion of the disk, (d) is a transverse section view of the disk, and (e) is a wave form diagram of reproduced signal;
Figure 3 is a diagram illustrating a piracy prevention algorithm;
Figure 4 is a diagram showing a procedure for playing back a PCA area in a tracking ON condition;
Figure 5 is a diagram showing the arrangement of stripes on a disk and the contents of control data;
Figure 6 is a diagram showing a stripe area and an address area on a disk;
Figure 7 is a flow chart illustrating how control mode is switched between CAV and CLV when playing back stripes, and
Figure 8 is a diagram showing a procedure for reading control data for playback.

[0010] In the description hereinafter given, position information for piracy prevention, which is a form of ID, is taken as an example of information to be barcoded.

[0011] We will first describe a general process flow from disk manufacturing to the completion of an optical disk by using the flowchart of Figure 1.

[0012] In this patent specification, laser trimming is also referred to as laser marking, while a nonreflective optical marking portion is simply referred to as the barcode, stripe, marking, or optical marking or, sometimes, as the physical ID unique to a disk.

[0013] First, the software company performs software authoring in software production process 820. The completed software is delivered from the software company to the disk manufacturing factory. In disk manufacturing process 816 at the disk manufacturing factory, the completed software is input in step 818a, a master disk is produced (step 818b), disks are pressed (steps 818e, 818g), reflective films are formed on the respective disks (steps 818f, 818h), the two disks are laminated together (step 818i), and a ROM disk such as a DVD or CD is completed (step 818m, etc.).

[0014] The thus completed disk 800 is delivered to the software maker or to a factory under control of the software maker, where, in secondary recording process 817, an anti-piracy marking 584, such the one shown in Figure 2, is formed (step 819a), and accurate position information of this mark is read by a measuring means (step 819b) to obtain the position information which serves as the physical feature information of the disk. This physical feature information of the disk is encrypted in step 819c. The encrypted information is converted to a PE-RZ-modulated signal which is then recorded in step 819d as a barcode signal on the disk by using a laser. The disk physical feature information may be combined together with software feature information for encryption in step 819c.

[0015] By removing the reflective film by laser light, in the manufacturing process of the disk, a waveform easily distinguishable from that of a pit signal is obtained when reproducing the disk. Rather than forming the barcode of the invention by removing the reflective film by laser light, the barcode may be formed by changing the shape of pits on the master disk.

[0016] Next, the constitution and operation of a reproduction apparatus (player) for reproducing the thus completed optical disk on a player will be described with reference to Figure 3.

[0017] In the figure, the construction of an optical disk

9102 will be described first. A marking 9103 is formed on a reflective layer (not shown) deposited on the optical disk 9102. In the manufacturing process of the optical disk, the position of the marking 9103 was detected by position detecting means, and the detected position was encrypted as marking position information and written on the optical disk in the form of a barcode 9104.

[0018] Position information reading means 9101 reads the barcode 9104, and decrypting means 9105 contained therein decrypts the contents of the barcode for output. Marking reading means 9106 reads the actual position of the marking 9103 and outputs the result. Comparing/judging means 9107 compares the decrypted result from the decrypting means 9105 contained in the position information reading means 9101 with the result of reading by the marking reading means 9106, and judges whether the two agree within a predetermined allowable range. If they agree, a reproduction signal 9108 for reproducing the optical disk is output; if they do not agree, a reproduction stop signal 9109 is output. Control means (not shown) controls the reproduction operation of the optical disk in accordance with these signals; when the reproduction stop signal is output, an indication to the effect that the optical disk is an illegal duplicated disk is displayed on a display (not shown) and the reproduction operation is stopped. In the above operation, it will be recognized that it is also possible for the marking reading means 9106 to use the decrypted result from the decrypting means 9105 when reading the actual position of the marking 9103. Namely in this case, the marking reading means 9106 checks whether the marking is actually located in the position on the optical disk indicated by the position information which is decrypted by the decrypting means 9105.

[0019] Thus the reproduction apparatus of the above construction can detect an illegally duplicated optical disk and stop the reproduction operation of the disk, and can prevent illegal duplicates practically .

[0020] We will next describe features of the optical disk format with a barcode formed in the above manner, tracking control methods, and rotational speed control methods that can be used when playing back the optical disk.

[0021] We will first describe the features of the optical disk format with a barcode formed according to the present embodiment, while dealing with an example of a condition that permits tracking control during playback (this condition is also referred to as the tracking ON condition). A playback operation using tracking control is shown in Figure 4, and its details will be given later.

[0022] In the case of a DVD disk, all data are recorded in pits with CLV, as shown in Figure 5. Stripes 923 (forming a barcode) are recorded with CAV. CLV recording means recording with constant linear velocity, while CAV recording means recording with constant angular velocity.

[0023] In the present invention, the stripes 923 are recorded with CAV, superimposed on a pre-pit signal in a lead-in data area holding an address which is recorded with CLV. That is, the data is overwritten with the stripes.

[0024] The pre-pit signal area maps into all the data areas where pits are formed. The prescribed region of the pre-pit signal area corresponds to an inner portion of the optical disk; this region is also called a post-cutting area (PCA). In this PCA area, the barcode is recorded with CAV, superimposed on pre-bit signals. In this way, the CLV data is recorded with a pit pattern from the master disk, while the CAV data is recorded with laser-removed portions of the reflective film. Since the barcode data is written in overwriting fashion, pits are recorded between the barcode stripes IT, 2T, and 3T. Using this pit information, optical head tracking is accomplished, and Tmax or Tmin of the pit information can be detected; therefore, motor rotational speed is controlled by detecting this signal. To detect Tmin, the relation between the trimming width t of stripe 923a and the pit clock T (pit) should be $t > 14T$ (pit), as shown in Figure 5, to achieve the above effect. If t is shorter than 14T, the pulse width of the signal from the stripe 923a becomes equal to the pulse width of the pit signal, and discrimination between them is not possible, so that the signal from the stripe 923a cannot be demodulated. To enable pit address information to be read at the same radius position as the stripes, an address area 944 is provided longer than a unit of one address of pit information, as shown in Figure 6; address information can thus be obtained, making it possible to jump to the desired track. Furthermore, the ratio of the stripe area to the non-stripe area, that is, the duty ratio, is made less than 50%, i.e., $T(S) < T(NS)$; since the effective reflectivity decreases only by 6 dB, this has the effect of ensuring stable focusing of the optical head.

[0025] Next, we will describe an example of a condition in which tracking control cannot be applied during playback (this condition is also referred to as the tracking OFF condition).

[0026] Since the stripes 923 are written over pits, interrupting pit signals and preventing correct playback of the pit data, tracking control may not be possible on some players. In such players, the strips 923, which are CAV data, can be read by the optical pickup by applying rotational control using a rotational pulse from a Hall element, etc. in the motor 17.

[0027] Figure 7 shows a flowchart illustrating a procedure for operations in a playback apparatus when pit data in the optical tracks in the stripe area cannot be correctly played back.

[0028] In Figure 7, when a disk is inserted in step 930a, the optical head is moved by a prescribed distance to the inner portion in step 930b. The optical head is thus positioned on the area where the stripes 923 of Figure 5 are recorded.

[0029] Here, it is not possible to correctly playback data from all the pits recorded in the stripe area 923. In this case, therefore, usual rotation phase control cannot be applied for the playback of the pit data recorded with

CLV.

[0030] In step 930c, rotational speed control is applied by using a rotational sensor of a Hall element in the motor or by measuring the T(max) or T(min) or frequency of a pit signal. If it is determined in step 930i that there are no stripes, the process jumps to step 930f. If there are stripes, the barcode is played back in step 930d, and when playback of the barcode is completed in step 930e, the optical head is moved in step 930f to an outer area where no stripes are recorded. In this area, since no stripes are recorded, the pits are played back correctly and accurate focus and tracking servo are achieved. Since the pit signal can be played back, usual rotation phase control can be performed to rotate the disk with CLV. As a result, in step 930h, the pit signal is played back correctly.

[0031] By switching between the two rotation control modes, i.e., the rotational speed control and the rotation phase control by pit signals, the effect is obtained that two different kinds of data, barcode stripe data and pit-recorded data, can be played back. Since the stripes are recorded in the innermost area, switching means measures the radius position of the optical head from the optical head stopper or from the address of a pit signal, and based on the result of the measurement, correctly performs switching between the two rotation control modes.

[0032] In a playback method for playing back an optical disk on which a stripe presence/absence identifier 937 is not defined, tracking is not applied in the stripe area on an optical disk of this type, so that, it takes time to distinguish between a stripe pattern legally formed on the disk and an irregular pattern caused by scratches on the disk surface. Therefore, regardless of whether the stripes are recorded or not, the playback procedure has to perform a stripe reading operation first, to check the presence or absence of stripes or whether the stripes are recorded in the inner portion of the optical disk. This may cause a problem in that an extra time is required before the data can be actually played back. The invention improves on this point.

[0033] First, as shown in Figure 8, when an optical disk is inserted, control data is played back in step 940a. Usually, physical feature information and attribute information of the optical disk are recorded as control data in a control data area. The physical feature information includes, for example, information indicating that the optical disk is a laminated-type disk of a two-layer, single-sided structure.

[0034] In the present invention, as shown in Figure 5, the control data recorded in the control data area 936 of the optical disk contains a PCA stripe presence/absence identifier 937 recorded as a pit signal. Therefore, the optical head is first moved, in step 940n, to an outer area where the control data is recorded. And then the optical head moves inwardly jumping across a plurality of tracks until reaching the control data area 936. And then in step 940a, the control data is played back. It can thus be checked whether the stripes are recorded or not. If, in step 940b, the stripe presence/absence identifier is 0, the process proceeds to step 940f to initiate rotation phase control for normal playback with CLV. On the other hand, if, in step 940b, the presence/absence identifier 937 is 1, then the process proceeds to step 940h to check the presence or absence of a reverse-side record identifier 948 which indicates that the stripes are recorded on the side opposite from the side being played back, that is, on the reverse side. If the stripes are recorded on the reverse side, the process proceeds to step 940i to play back the recording surface on the reverse side of the optical disk. If the reverse side cannot be automatically played back, an indication is output for display, to urge the user to turn over the disk. If it is determined in step 940h that the stripes are recorded on the side being played back, the process proceeds to step 940c, where the head is moved to the stripe area 923 in the inner portion of the disk, and in step 940d, the control mode is switched to rotational speed control to play back the stripes 923 with CAV rotation. If the playback is completed in step 940e, then in step 940f the control mode is switched back to rotation phase control for CLV playback and the optical head is moved to the outer portion of the disk to play back pit signal data.

[0035] Since the stripe presence/absence identifier 937 is recorded in the pit area holding the control data, etc., as described above, the invention has the effect of being able to play back the stripes more reliably and more quickly compared to a playback method which does not refer to a stripe presence/absence identifier.

[0036] Further, as shown in Figure 5, the control data also contains an additional stripe data presence/absence identifier and a stripe recording capacity. That is, after recording first stripes on an optical disk, additional stripes can be recorded in an empty, unrecorded portion of the area. The first recorded stripes will be referred to as the first set of stripes, and the additionally recorded stripes as the second set of stripes. With this configuration, when the first set of stripes 923 is already recorded by trimming, as shown in Figure 5, the capacity of the available space for trimming the second set of stripes 938 can be calculated. Accordingly, when the recording apparatus performs trimming to record the second set of stripes, the control data provides an indication of how much space is available for additional recording; this prevents the possibility of destroying the first set of stripes by recording more than 360° over the area. Furthermore, as shown in Figure 5, a gap 949 longer than one pit-signal frame length is provided between the first set of stripes 923 and the second set of stripes 938; this serves to prevent the previously recorded trimming data from being destroyed.

Claims

1. An optical disk on which data is recorded and com-

prising of a location (923) for receiving a barcode-like mark extending in a circumferential direction and having a plurality of bars (923a, 923b...) each extending in a radial direction, characterized in that said optical disk further comprises of an identifier (937) for indicating whether a barcode-like mark is present or not on said location (923) of the disk, said identifier (937) being provided in a pit area holding control data (936).

2. An optical disk according to claim 1, wherein one of said bars (923a), when present, has a lower reflectivity than an average reflectivity of an area between said one of said bars (923a) and another of said bars (923b)

3. An optical disk reproduction apparatus for use with a disk according to claim 1 characterized by comprising:

reproduction means (9106) for reproducing said barcode-like mark on said optical disk,

identifier detection means (9106) for detecting said identifier (937) on said optical disk, and

control means for controlling a prescribed operation based on the contents of said identifier (937) detected by said identifier detection means (9106).

4. An optical disk reproduction apparatus according to claim 3, wherein said reproduction means includes an optical head for performing reproduction of the data of said disk.

5. An optical disk reproduction apparatus according to claim 3, wherein an indication of absence of said barcode-like mark is output.

Patentansprüche

1. Optische Platte, auf der Daten aufgezeichnet werden und die einen Ort (923) zur Aufnahme einer strichcodeähnlichen Markierung umfasst, die sich in Umfangrichtung erstreckt und eine Mehrzahl von Strichen (923a, 923b ...) aufweist, von denen sich jeder in einer radialen Richtung erstreckt, **dadurch gekennzeichnet,** dass die optische Platte des Weiteren eine Kennung (937) zur Angabe umfasst, ob eine strichcodeähnliche Markierung an dem genannten Ort (923) der Platte vorhanden ist oder nicht, wobei die Kennung (937) in einem Steuerdaten (936) aufweisenden Muldenbereich vorgesehen ist.

2. Optische Platte gemäß Anspruch 1, wobei einer der Striche (923a), wenn vorhanden, ein geringeres Reflexionsvermögen als ein Durchschnittsreflexionsvermögen eines Bereichs zwischen diesem einen Strich (923a) und einem anderen der Striche (923b) aufweist.

3. Wiedergabevorrichtung für eine optische Platte zur Verwendung mit einer Platte gemäß Anspruch 1, **dadurch gekennzeichnet**, dass sie umfasst:

eine Wiedergabeeinrichtung (9106) zur Wiedergabe der strichcodeförmigen Markierung auf der optischen Platte,

eine Kennungserfassungseinrichtung (9106) zur Erfassung der Kennung (937) auf der optischen Platte, und

eine Steuerungseinrichtung zum Steuern eines vorgeschriebenen Vorgangs auf der Grundlage des Inhalts der Kennung (937), die von der Kennungserfassungseinrichtung (9106) erfasst wurde.

4. Wiedergabevorrichtung für eine optische Platte gemäß Anspruch 3, wobei die Wiedergabeeinrichtung einen optischen Kopf zur Ausführung einer Wiedergabe der Daten der Platte umfasst.

5. Wiedergabevorrichtung für eine optische Platte gemäß Anspruch 3, wobei eine Angabe über das Fehlen der strichcodeartigen Markierung ausgegeben wird.

Revendications

1. Disque optique sur lequel des données sont enregistrées et comprenant un emplacement (923) pour recevoir une marque du type par code à barres s'étendant dans une direction circonférentielle et comportant une pluralité de barres (923a, 923b, ...) s'étendant chacune dans une direction radiale, caractérisé en ce que ledit disque optique comprend en outre un identifiant (937) pour indiquer si une marque du type par code à barres est présente ou non au niveau dudit emplacement (923) du disque, ledit identifiant (937) étant prévu dans une zone de cuvette contenant des données de commande (936).

2. Disque optique selon la revendication 1, dans lequel l'une desdites barres (923a), lorsqu'elle est présente, a une réflectivité inférieure à la réflectivité moyenne d'une zone comprise entre ladite une desdites barres (923a) et une autre desdites barres (923b).

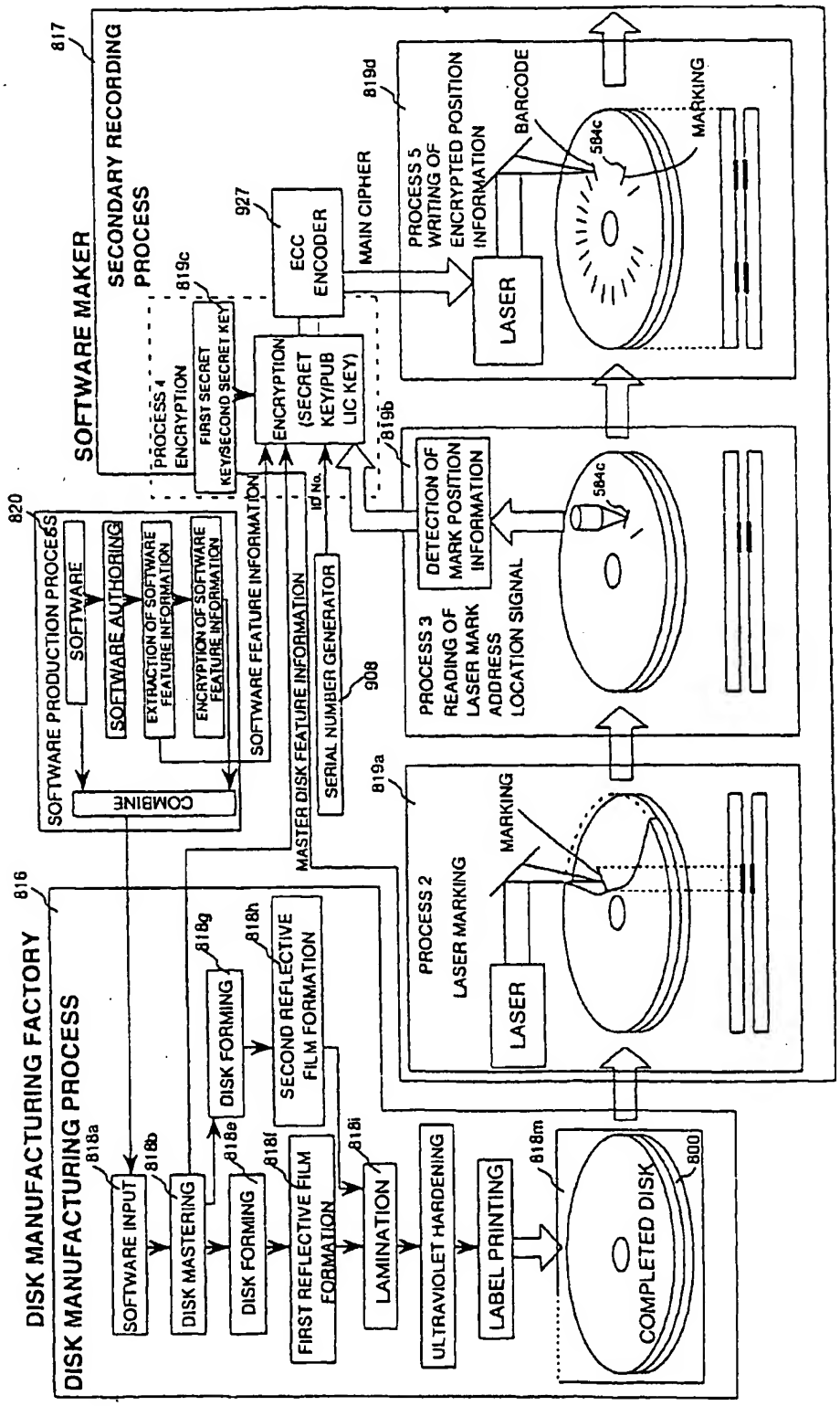
3. Appareil de reproduction de disque optique destiné à être utilisé avec un disque selon la revendication 1, caractérisé par le fait qu'il comprend :

des moyens de reproduction (9106) pour reproduire ladite marque du type par code à barres sur ledit disque optique,
des moyens de détection d'identifiant (9106) pour détecter ledit identifiant (937) sur ledit disque optique, et
des moyens de commande pour commander une opération prescrite basée sur le contenu dudit identifiant (937) détecté par lesdits moyens de détection d'identifiant (9106).

4. Appareil de reproduction de disque optique selon la revendication 3, dans lequel lesdits moyens de reproduction comportent une tête optique pour effectuer la reproduction des données dudit disque.

5. Appareil de reproduction de disque optique selon la revendication 3, dans lequel une indication d'absence de ladite marque du type par code à barres est délivrée en sortie.

Fig. 1


DISK MANUFACTURING FACTORY
816
DISK MANUFACTURING PROCESS
SOFTWARE INPUT
818a
DISK MASTERING
818b
DISK FORMING
818e
FIRST REFLECTIVE FILM FORMATION
818f
LAMINATION
818i
ULTRAVIOLET HARDENING
LABEL PRINTING
818m
COMPLETED DISK
800
DISK FORMING
818g
SECOND REFLECTIVE FILM FORMATION
818h
SOFTWARE MAKER
817
SECONDARY RECORDING PROCESS
PROCESS 4 ENCRYPTION
819c
FIRST SECRET KEY/SECOND SECRET KEY
ENCRYPTION (SECRET KEY/PUBLIC KEY)
ECC ENCODER
927
MAIN CIPHER
PROCESS 5 WRITING OF ENCRYPTED POSITION INFORMATION
819d
BARCODE
MARKING
LASER
584c
SOFTWARE PRODUCTION PROCESS
820
SOFTWARE
SOFTWARE AUTHORING
EXTRACTION OF SOFTWARE FEATURE INFORMATION
ENCRYPTION OF SOFTWARE FEATURE INFORMATION
COMBINE
SOFTWARE FEATURE INFORMATION
MASTER DISK FEATURE INFORMATION
ID No.
SERIAL NUMBER GENERATOR
908
819b
DETECTION OF MARK POSITION INFORMATION
PROCESS 3 READING OF LASER MARK ADDRESS LOCATION SIGNAL
819a
PROCESS 2 LASER MARKING

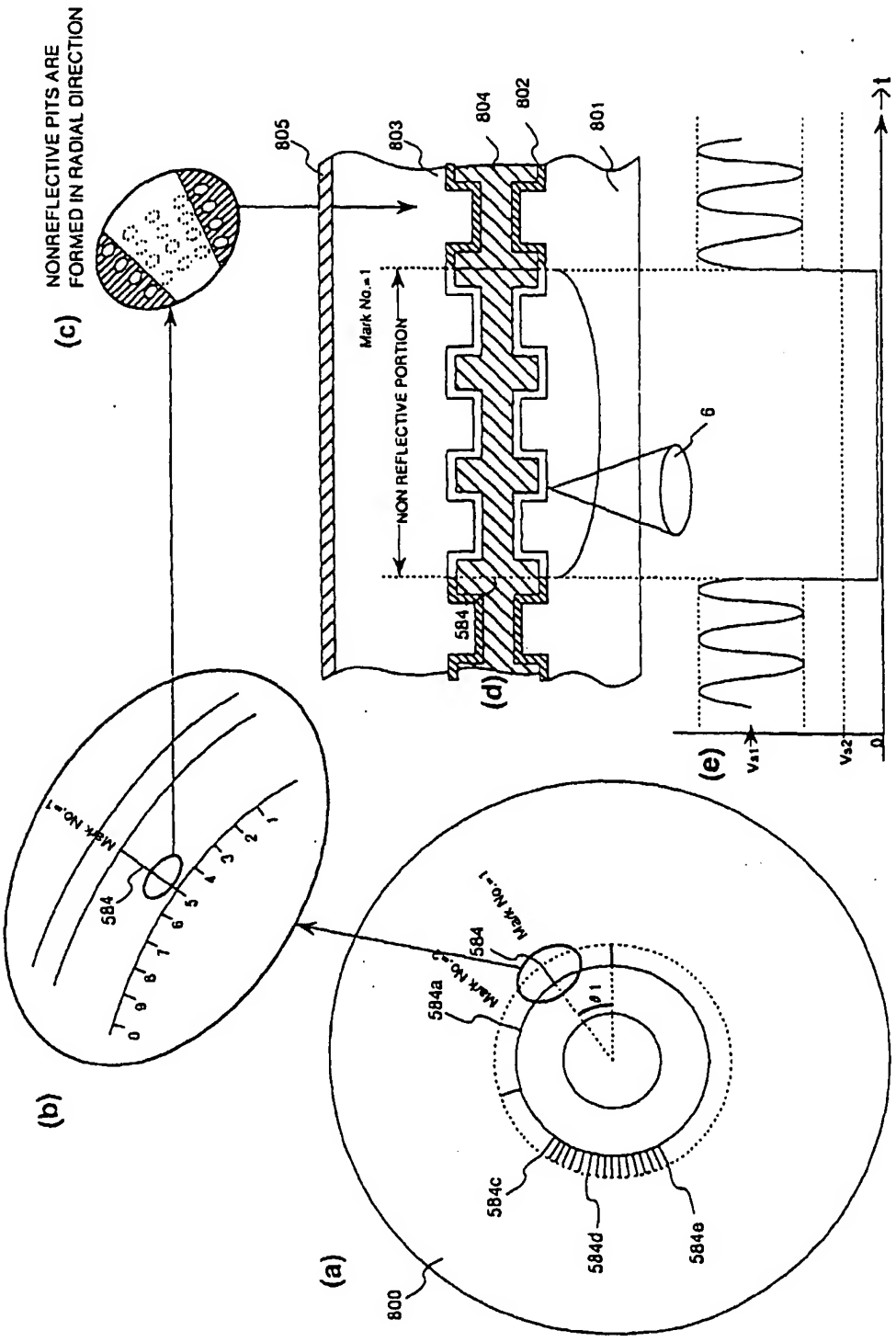

(a)
800
584c
584d
584e
584a
584
Mark No.=1
(b)
Mark No.=1
584
0
1
2
3
4
5
6
7
8
9
(c)
NONREFLECTIVE PITS ARE FORMED IN RADIAL DIRECTION
(d)
805
803
804
802
801
Mark No.=1
NON REFLECTIVE PORTION
584
6
(e)
Vs1
Vs2
0
t

Fig. 2

Fig.3

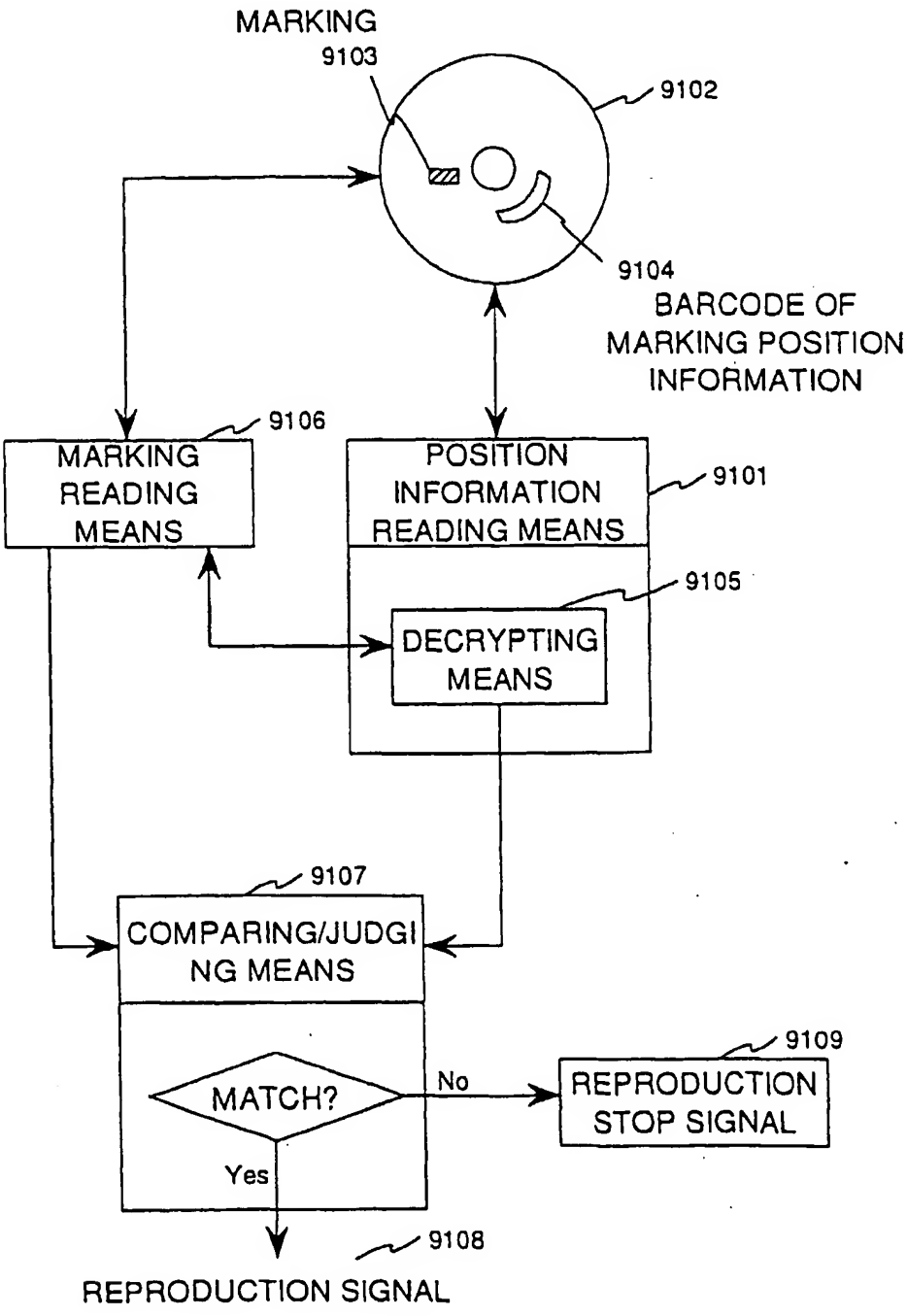
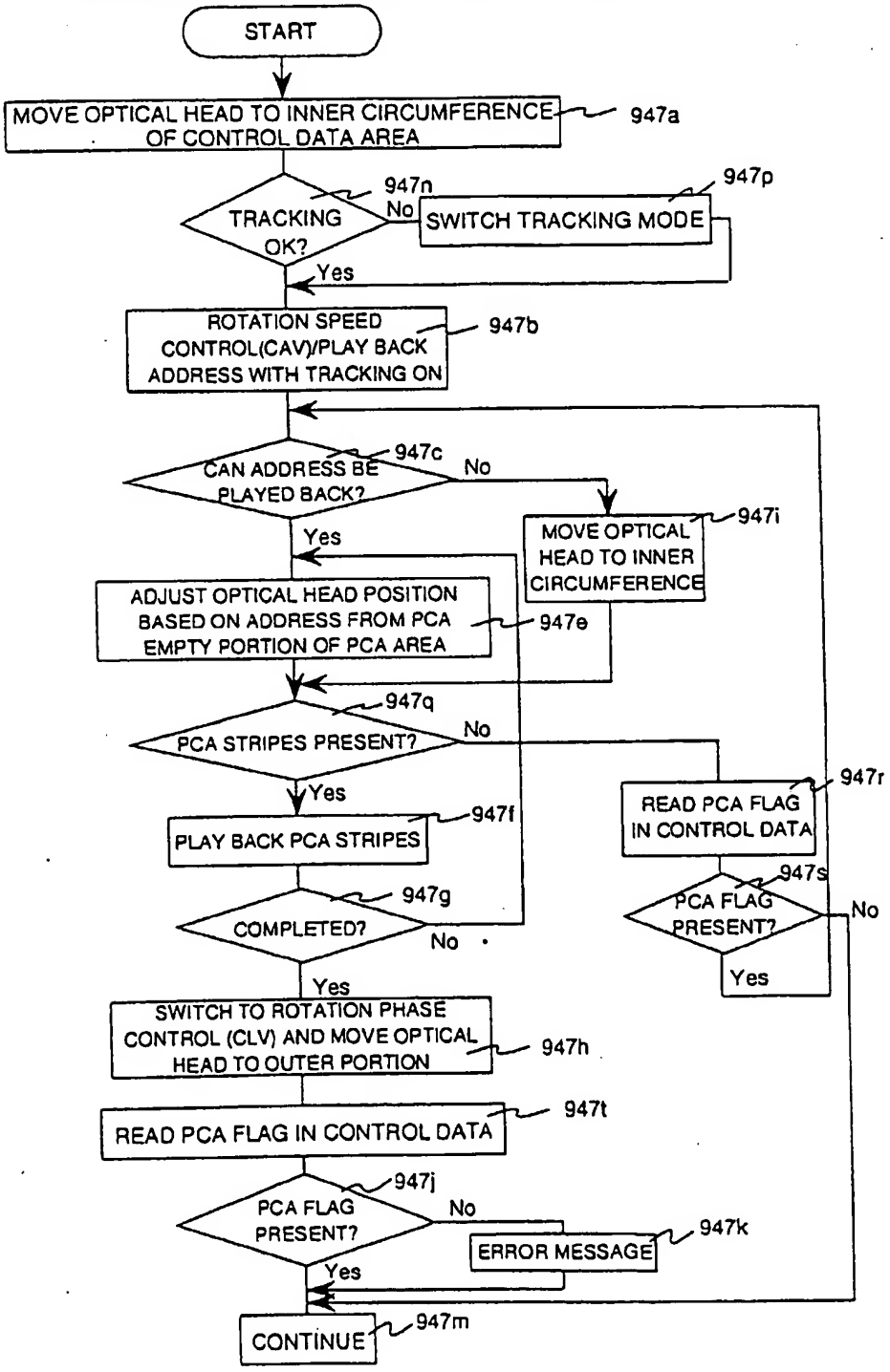

MARKING
9103
9102
9104
BARCODE OF MARKING POSITION INFORMATION
9106
MARKING READING MEANS
POSITION INFORMATION READING MEANS
9101
9105
DECRYPTING MEANS
9107
COMPARING/JUDGING MEANS
MATCH?
No
9109
REPRODUCTION STOP SIGNAL
Yes
9108
REPRODUCTION SIGNAL

Fig.4

FLOWCHART WHEN OPTICAL HEAD LANDS AT INNER CIRCUMFERENCE OF CONTROL DATA AREA



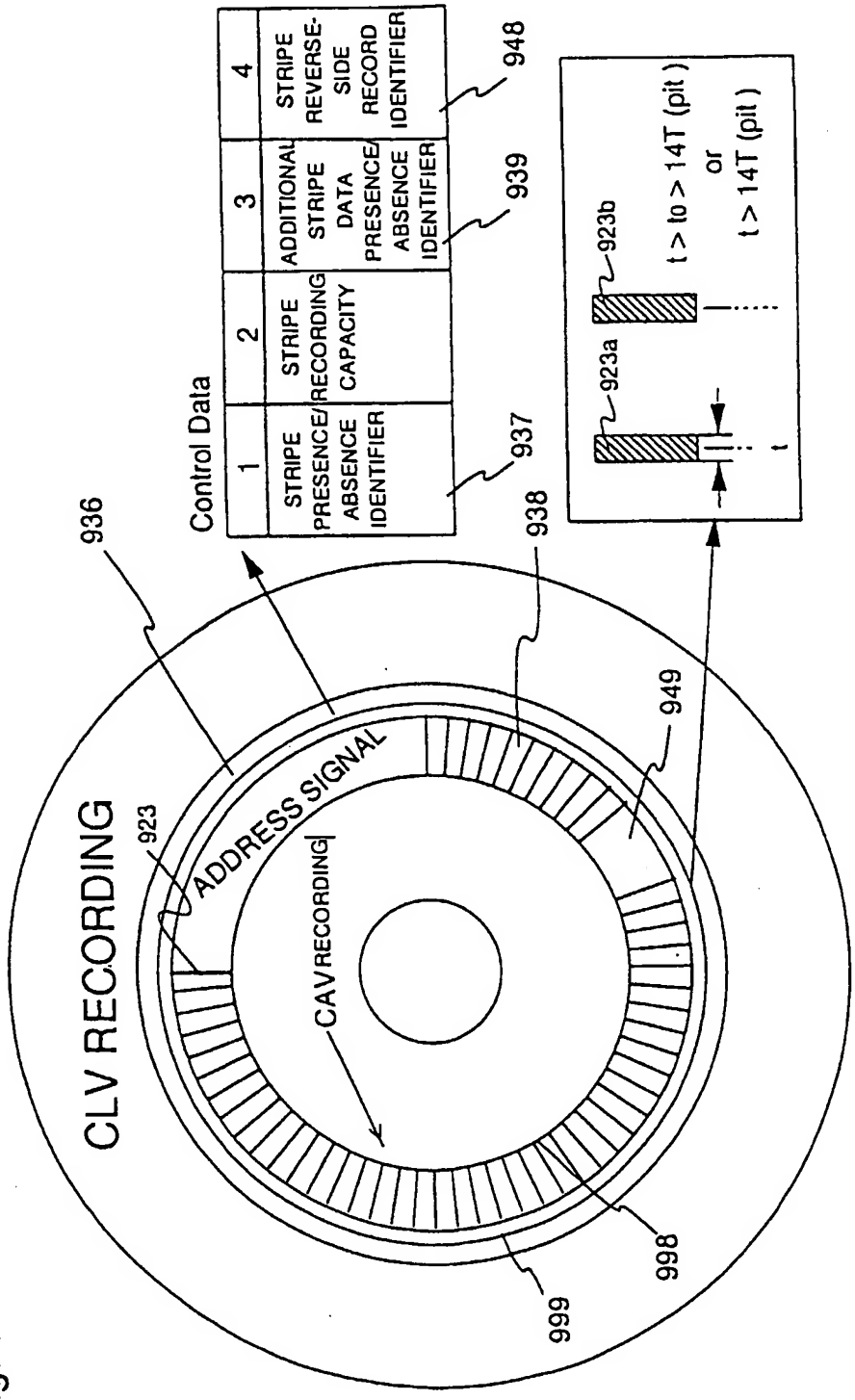

CLV RECORDING
936
923
ADDRESS SIGNAL
CAV RECORDING
938
949
998
999
Control Data
1
STRIPE PRESENCE/ ABSENCE IDENTIFIER
937
2
STRIPE RECORDING CAPACITY
3
ADDITIONAL STRIPE DATA PRESENCE/ ABSENCE IDENTIFIER
939
4
STRIPE REVERSE-SIDE RECORD IDENTIFIER
948
923a
923b
t > to > 14T (pit)
or
t > 14T (pit)
t

Fig. 5

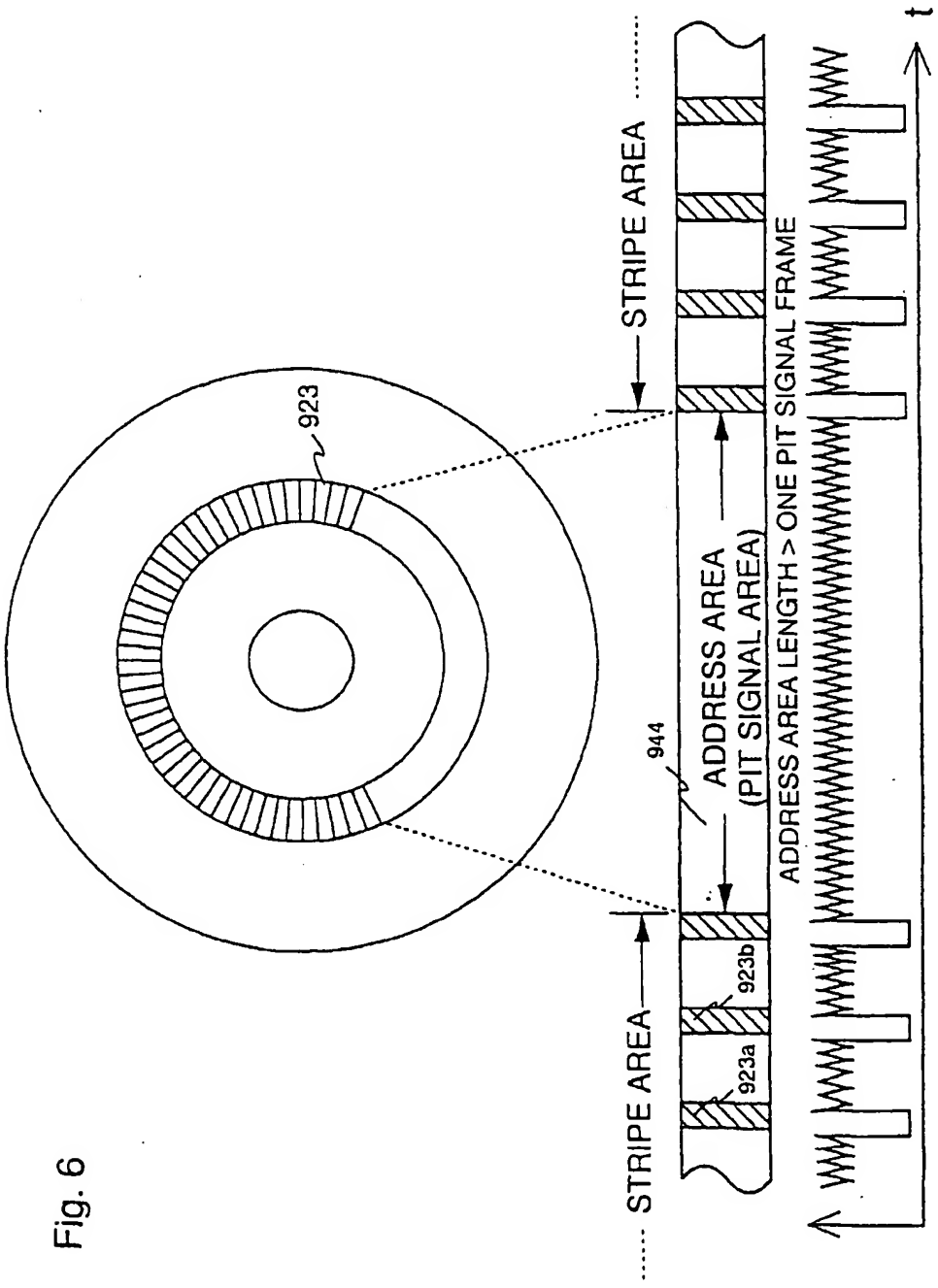

923
STRIPE AREA
ADDRESS AREA
(PIT SIGNAL AREA)
944
923b
923a
STRIPE AREA
ADDRESS AREA LENGTH > ONE PIT SIGNAL FRAME
t

Fig. 6

Fig. 7

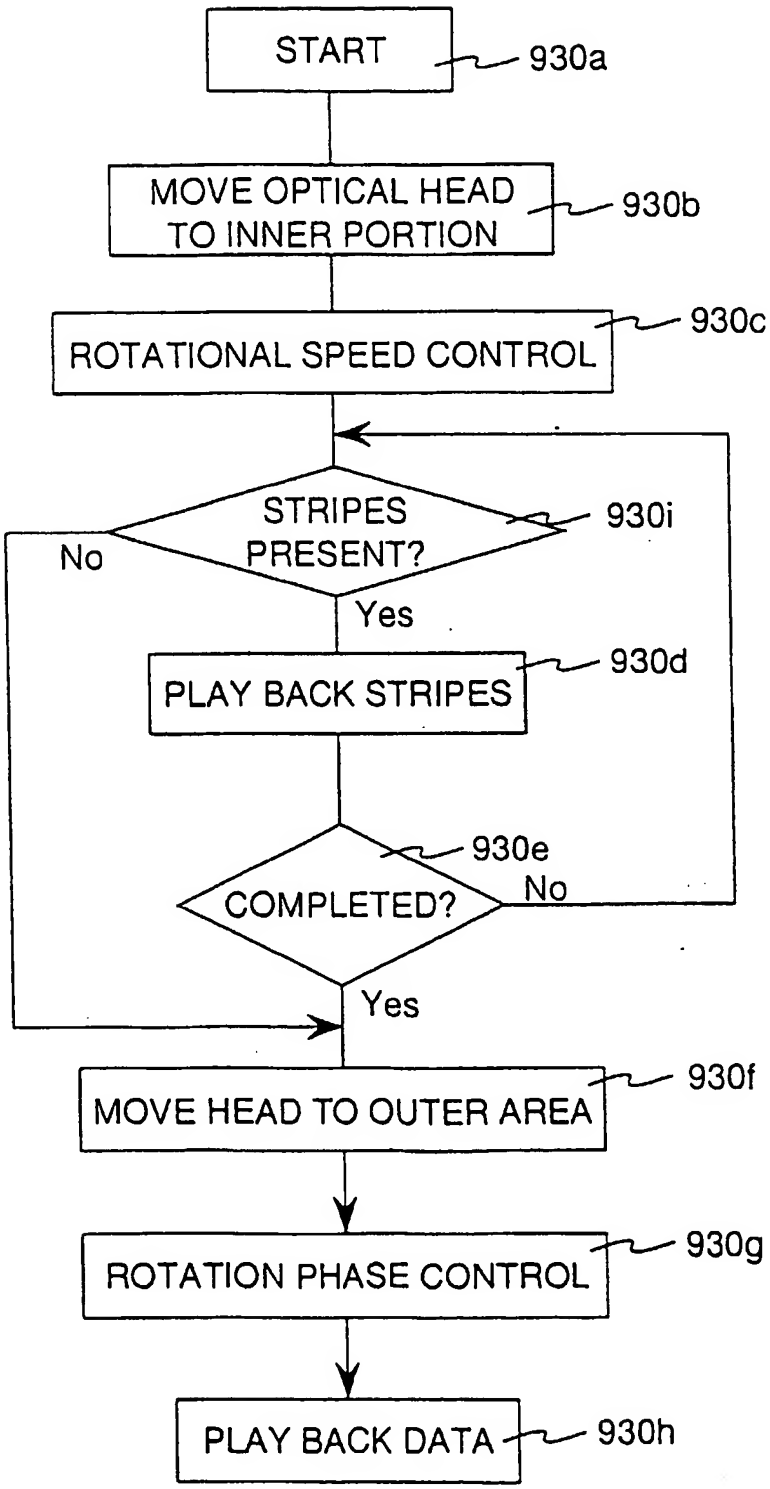
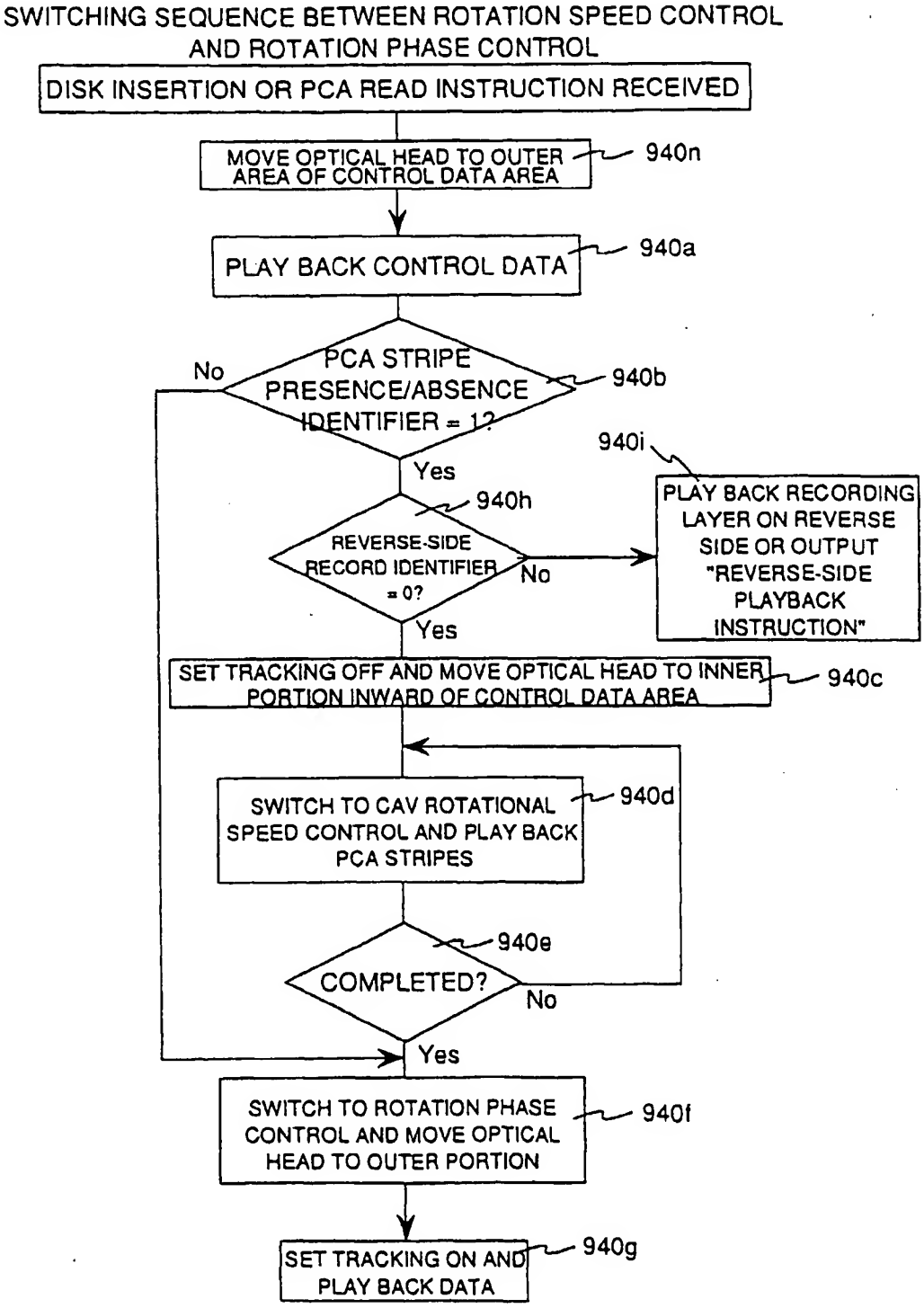

START
930a
MOVE OPTICAL HEAD TO INNER PORTION
930b
ROTATIONAL SPEED CONTROL
930c
STRIPES PRESENT?
930i
No
Yes
PLAY BACK STRIPES
930d
930e
COMPLETED?
No
Yes
MOVE HEAD TO OUTER AREA
930f
ROTATION PHASE CONTROL
930g
PLAY BACK DATA
930h

Fig. 8


SWITCHING SEQUENCE BETWEEN ROTATION SPEED CONTROL AND ROTATION PHASE CONTROL
DISK INSERTION OR PCA READ INSTRUCTION RECEIVED
MOVE OPTICAL HEAD TO OUTER AREA OF CONTROL DATA AREA
940n
PLAY BACK CONTROL DATA
940a
PCA STRIPE PRESENCE/ABSENCE IDENTIFIER = 1?
940b
No
Yes
940i
PLAY BACK RECORDING LAYER ON REVERSE SIDE OR OUTPUT "REVERSE-SIDE PLAYBACK INSTRUCTION"
940h
REVERSE-SIDE RECORD IDENTIFIER = 0?
No
Yes
SET TRACKING OFF AND MOVE OPTICAL HEAD TO INNER PORTION INWARD OF CONTROL DATA AREA
940c
SWITCH TO CAV ROTATIONAL SPEED CONTROL AND PLAY BACK PCA STRIPES
940d
940e
COMPLETED?
No
Yes
SWITCH TO ROTATION PHASE CONTROL AND MOVE OPTICAL HEAD TO OUTER PORTION
940f
SET TRACKING ON AND PLAY BACK DATA
940g